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IMPULSIVE CONTROL AND SYNCHRONIZATION OF A NEW CHAOTIC SYSTEM

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Abstract. In this paper, we investigate the issue on the stabilizing and synchronization of the new chaotic system proposed by [11] via an impulsive method. Some new and less conservative criteria for the global exponential stability and asymptotical stability of impulsively controlled new chaotic system are obtained with varying impulsive intervals. In particular, some simple and easily verified criteria are established with equivalent impulsive intervals. An illustrative example is finally included to visualize the effectiveness and feasibility of the developed methods.
Keywords. chaotic system; impulsive control; synchronization.

1 Introduction

In 1963, Lorenz found the first chaotic attractor in a three-dimensional autonomous system when he studied the atmospheric convection [1]. As the first chaotic model, the Lorenz system has become a paradigm for chaos research. Since the discovery of the Lorenz system, more chaotic (hyperchaotic) systems have been constructed such as *Rössler* system, hyperchaotic *Rössler* system, Chua's circuit, *Hénon* attractor, Logistic map, Chen system, generalized Lorenz system, hyperchaotic MCK circuit, hyperchaotic Chen system, etc. [2-10]. Nowadays, it is perhaps not difficult to construct a new chaotic (hyperchaotic) system. Recently, Qi and Chen et al.[11] add a cross-product nonlinear term to the first equation of the Lorenz system, obtaining a new system as follows:

$$\begin{cases} \dot{x_1} = a(x_2 - x_1) + x_2x_3, \\ \dot{x_2} = cx_1 - x_2 - x_1x_3, \\ \dot{x_3} = x_1x_2 - bx_3, \end{cases} \tag{1}$$

where dot denotes differentiation with respect to time t. System (1) has the following basic properties:

(1) *Symmetry* about the z-axis, which is invariant for the coordinate transformation $(x_1, y_1, z_1) \to (-x_1, -y_1, z_1)$.

(2) Dissipation: as long as $a + b + 1 > 0$ system (1) is dissipative.

(3) Stability: System (1) is globally, unanimously and asymptotically stable about the origin under the condition $c < \frac{a}{a+1}$.